

CLAIMS

1. An ultrasonic diagnostic apparatus for diagnosing vascular endothelial function, said apparatus comprising:
 - an ultrasonic transmitter for transmitting ultrasonic transmission waves into tissues of living body;
 - an ultrasonic receiver for receiving an ultrasonic echo from vascular wall in said tissues of living body;
 - a phase detector for detecting a phase of said ultrasonic echo;
 - an arithmetic unit for obtaining thickness change between two arbitrary positions among a plurality of positions with said vascular wall from a phase detection signal determined at said phase detector, and for obtaining elastic modulus of said vascular wall from said thickness change and a blood pressure value; and
 - at least one of a storage unit or a display unit,
- 20 said storage unit storing changes over time of elastic modulus of said vascular wall when artery is avascularized and the avascularization is then stopped, and said display unit displaying changes over time of elastic modulus of said vascular wall when artery is avascularized and the avascularization is then stopped.
- 25

2. An ultrasonic diagnostic apparatus for diagnosing vascular endothelial function said apparatus comprising:
 - an ultrasonic transmitter for transmitting
- 5 ultrasonic transmission waves into tissues of living body;
 - an ultrasonic receiver for receiving an ultrasonic echo from vascular wall in said tissues of living body;
 - a phase detector for detecting a phase of said
- 10 ultrasonic echo;
 - an arithmetic unit for obtaining positional displacement of a plurality of positions within said vascular wall from a phase detection signal determined at said phase detector, obtaining thickness change
- 15 between two arbitrary positions among said plurality of positions from a difference between positional changes of said two positions, and determining elastic modulus of said vascular wall from said thickness change and a blood pressure value; and
- 20 at least one of a storage unit or a display unit, said storage unit storing changes over time of elastic modulus of said vascular wall when artery is avascularized and the avascularization is then stopped, and said display unit displaying changes over time of
- 25 elastic modulus of said vascular wall when artery is

avascularized and the avascularization is then stopped.

3. The ultrasonic diagnostic apparatus according to claim 1 or 2, wherein said arithmetic unit obtains
5 elastic modulus of the vascular wall including at least a part of tunica media.

4. The ultrasonic diagnostic apparatus according to claim 3, wherein said arithmetic unit obtains elastic
10 modulus of the vascular wall in tunica intima and tunica media.

5. An ultrasonic diagnostic method for diagnosing vascular endothelial function by using an ultrasonic
15 diagnostic apparatus, comprising a transmitter/receiver for transmitting and receiving ultrasonic waves, a phase detector for detecting a phase of the received ultrasonic echo, and an arithmetic unit for calculating elastic modulus of vascular wall based on an ultrasonic
20 echo obtained through phase detection, wherein said method comprising:
a step (A) of transmitting ultrasonic waves into tissues of living body including vascular wall, and receiving an ultrasonic echo obtained when said
25 ultrasonic waves is reflected and scattered by said

vascular wall;

a step (B) of detecting a phase of said ultrasonic echo;

a step (C) of obtaining thickness change between

- 5 two arbitrary positions among a plurality of positions within said vascular wall from a phase detection signal determined by said phase detector, and determining elastic modulus of said vascular wall from said thickness change and a blood pressure value; and

- 10 at least one of a step (D) of storing changes over time of elastic modulus of said vascular wall when avascularizing artery and then avascularization is stopped or a step (E) of displaying changes over time of elastic modulus of said vascular wall when
15 avascularizing artery and then avascularization is stopped.

6. An ultrasonic diagnostic method for diagnosing vascular endothelial function by using an ultrasonic

- 20 diagnostic apparatus, comprising a transmitter/receiver for transmitting and receiving ultrasonic waves, a phase detector for detecting a phase of the received ultrasonic echo, and an arithmetic unit for calculating elastic modulus of vascular wall based on an ultrasonic
25 echo obtained through phase detection, wherein said

method comprising:

a step (A) of transmitting ultrasonic waves into tissues of living body including vascular wall, and receiving an ultrasonic echo obtained when said

5 ultrasonic waves is reflected and scattered by said vascular wall;

a step (B) of detecting a phase of said ultrasonic echo;

a step (C) of obtaining positional displacement of
10 a plurality of positions within said vascular wall from a phase detection signal determined by said phase detector, obtaining thickness change between two arbitrary positions among said plurality of positions from a difference of positional displacement of said two
15 positions, and of determining elastic modulus of said vascular wall from said thickness change and a blood pressure value; and

at least one of a step (D) of storing changes over time of elastic modulus of said vascular wall when
20 avascularizing artery and then avascularization is stopped or a step (E) of displaying changes over time of elastic modulus of said vascular wall when avascularizing artery and then avascularization is stopped.

7. The ultrasonic diagnostic method according to claim 5 or 6, wherein said step (C) of obtaining said elastic modulus is a step of obtaining elastic modulus of vascular wall including at least a part of tunica media.

5

8. The ultrasonic diagnostic method according to claim 7, wherein said step (C) of determining elastic modulus is a step of determining elastic modulus of vascular wall in the region of tunica intima and tunica media.